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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/720,347	12/21/2000	Eugene Y. Ivanov	TSO 167 P2	1238

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EXAMINER

EDMONDSON, LYNNE RENEE

ART UNIT	PAPER NUMBER
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1725

DATE MAILED: 03/12/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/720,347

Applicant(s)

IVANOV ET AL.

Examiner

Lynne Edmondson

Art Unit

1725

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 January 2000.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 6-9, 12, 14-25 and 27-33 is/are rejected.
- 7) ☒ Claim(s) 4, 5, 10, 11, 13 and 26 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 December 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3 6) ☐ Other: _____

Art Unit: 1725

DETAILED ACTION

Claim Objections

1. Claims 28, 29 and 31 are objected to because of the following informalities: The claims are duplicates of claim 27 particularly when claim 27 is dependent from claims 5, 18 or 23. Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1, 8, 12, 14-22, 27, 29, 32 and 33 are rejected under 35 U.S.C. 102(b) as being anticipated by Fan (USPN 5269899).

Fan teaches a method of preparing a bonded sputter target/backing plate assembly comprising a metal target and Cu backing plate wherein a plurality of salient (grooved) portions are formed on at least one of the mating surfaces (figure 1 and col 4 lines 1-17). The plate and target are positioned adjacent one another forming an interlocked interface with a bent portion forming an angle of 45 degrees. Pressure is

Art Unit: 1725

applied to consolidate the assembly under low temperature (room temperature) (col 4 line 48 col 5 line 34). It is noted that the combination can be formed by any method.

4. Claims 1, 12, 14-21, 27-29 and 33 are rejected under 35 U.S.C. 102(b) as being anticipated by Boys (USPN 5215639).

Boys teaches a method of preparing a bonded sputter target/backing plate assembly comprising a metal target and backing plate (col 8 lines 3-22) wherein a plurality of salient (grooved) portions are formed on at least one of the mating surfaces (col 4 lines 29-54 and figure 10B). The plate and target are positioned adjacent one another forming an interlocked interface. Pressure is applied to consolidate the assembly under low temperature which may be room temperature in cold isostatic pressing (col 6 lines 50-59 and col 7 lines 24-46). A filler material is placed between the target and plate (col 8 lines 3-22). As shown in figures 10B and 10C the edge is bent at an angle of less than about 90 degrees and forms "V" shaped ridges (col 8 lines 40-69). As shown in figure 10C, these ridges are continuous which would form "M" shapes. It is noted that the combination can be formed by any method. See also Boys claims 1-19.

5. Claims 1, 27, 28 and 33 are rejected under 35 U.S.C. 102(b) as being anticipated by Mueller et al. (USPN 5230459).

Mueller teaches a method of preparing a bonded sputter target/backing plate assembly comprising a titanium target and an aluminum backing plate (col 4 lines 63-65) wherein a plurality of salient (grooved) portions are formed on at least one of the

Art Unit: 1725

mating surfaces (col 4 lines 5-23). The plate and target are positioned adjacent one another forming an interlocked interface. Pressure is applied to consolidate the assembly under low temperature (below melting points of plate and target metals) (col 4 lines 46-69) preferably less than 600 C (col 5 lines 1-5). As shown in figure 2 the edge is bent at an angle of less than about 90 degrees and form "V" shaped ridges (col 5 lines 13-44). It is noted that the combination can be formed by any method. See also Mueller claims 1, 5, 6 and 13-16.

6. Claims 1, 8, 14, 18, 22, 27, 28, 30 and 33 are rejected under 35 U.S.C. 102(e) as being anticipated by Hunt et al. (USPN 5836506).

Hunt teaches a method of preparing a bonded sputter target/backing plate assembly comprising an Al, Ti or Co target and an Al, Cu, steel or Ti backing plate (col 4 lines 16-24 and col 8 lines 17-40) wherein a plurality of salient (grooved) portions are formed on at least one of the mating surfaces (col 3 lines 50-60). The plate and target are positioned adjacent one another forming an interlocked interface. Pressure is applied to consolidate the assembly under low temperature (below 50% of melting points of plate and target metals) (col 4 lines 25-46, col 6 lines 27-50 and col 8 lines 1-18). Note that Al which has a melting point of 680 C is heated to 300 C (col 4 lines 28-29 and col 7 line 21). As shown in figures 8 and 9 the edge is bent at an angle of less than about 90 degrees and forms "V" shaped ridges (col 6 lines 13-38). As shown in figure 4, these ridges are continuous which would form "M" shapes. It is noted that the combination can be formed by any method. See also Hunt claims 1-19.

Art Unit: 1725

7. Claims 1, 8, 27-29 and 33 are rejected under 35 U.S.C. 102(e) as being anticipated by Zhang (USPN 6071389).

Zhang teaches a method of preparing a bonded sputter target/backing plate assembly comprising a titanium target and an aluminum or copper backing plate (col 2 lines 23-33) wherein a plurality of salient (grooved) portions with "V" or "M" shapes are formed on at least one of the mating surfaces and a filler material is applied (col 2 lines 33-67 and col 4 lines 35-48). The plate and target are positioned adjacent one another forming an interlocked interface (col 3 line 21 – col 4 line 2). Pressure is applied to consolidate the assembly under low temperature (below melting points) conditions (col 4 lines 3-34). As shown in figure 2 the edge is bent at an angle of less than about 90 degrees and form "V" shaped ridges (col 5 lines 13-44). It is noted that the combination can be formed by any method.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 2, 3 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mueller et al. (USPN 5230459) in view of Pierce et al. (USPN 4385979).

Mueller teaches a method of preparing a bonded sputter target/backing plate assembly comprising a titanium target and an aluminum backing plate (col 4 lines 63-

Art Unit: 1725

65) wherein a plurality of salient (grooved) portions are formed on at least one of the mating surfaces (col 4 lines 5-23). The plate and target are positioned adjacent one another forming an interlocked interface. Pressure is applied to consolidate the assembly under low temperature (below melting points of plate and target metals) (col 4 lines 46-69) preferably less than 600 C (col 5 lines 1-5). As shown in figure 2 the edge is bent at an angle of less than about 90 degrees and form "V" shaped ridges (col 5 lines 13-44). However, there is no disclosure of an additional peripheral weld or of the angle.

Pierce teaches bonding a target to a plate wherein the peripheral part of the assembly is tack welded prior to interfacial bonding (col 8 lines 10-13, col 8 lines 41-50 and col 11 line 39 – col 12 line 14). The target is made of copper (col 10 lines 25-62).

It would have been obvious to one of ordinary skill in the art at the time of the invention to provide an angle between 35 and 80 degrees and to apply an additional peripheral weld to prevent failures at the interface particularly with large targets and thereby provide an assembly that can be used over a wide range of power levels and temperatures (Mueller, col 5 lines 53-58) in a fast and cost-effective process (Mueller, col 5 lines 59-67 and col 6 lines 9-23).

10. Claims 2, 3, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hunt et al. (USPN 5836506) in view of Pierce et al. (USPN 4385979).

Hunt teaches a method of preparing a bonded sputter target/backing plate assembly comprising an Al, Ti or Co target and an Al, Cu, steel or Ti backing plate (col

Art Unit: 1725

4 lines 16-24 and col 8 lines 17-40) wherein a plurality of salient (grooved) portions are formed on at least one of the mating surfaces (col 3 lines 50-60). The plate and target are positioned adjacent one another forming an interlocked interface. Pressure is applied to consolidate the assembly under low temperature (below 50% of melting points of plate and target metals) (col 4 lines 25-46, col 6 lines 27-50 and col 8 lines 1-18). Note that Al which has a melting point of 680 C is heated to 300 C (col 4 lines 28-29 and col 7 line 21). As shown in figures 8 and 9 the edge is bent at an angle of less than about 90 degrees and forms "V" shaped ridges (col 6 lines 13-38). As shown in figure 4, these ridges are continuous which would form "M" shapes. However, there is no disclosure of an additional peripheral weld or of the angle.

Pierce teaches bonding a target to a plate wherein the peripheral part of the assembly is tack welded prior to interfacial bonding (col 8 lines 10-13, col 8 lines 41-50 and col 11 line 39 – col 12 line 14). The target is made of copper (col 10 lines 25-62).

It would have been obvious to one of ordinary skill in the art at the time of the invention to apply an additional peripheral weld to provide a strong reliable bond (Hunt, col 2 lines 9-19) of materials with different expansion rates and thereby prevent failures at the interface particularly with large targets and thereby provide an assembly that can be used over a wide range of power levels and temperatures (Hunt, col 2 lines 58-65 and col 4 lines 39-46).

11. Claims 7, 24, 25 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hunt et al. (USPN 5836506) in view of Pierce et al. (USPN 4385979)

Art Unit: 1725

as applied to claims 2 and 18 above, and further in view of Qamar et al. (USPN 5009765).

Hunt teaches a method of preparing a bonded sputter target/backing plate assembly comprising an Al, Ti or Co target and an Al, Cu, steel or Ti backing plate (col 4 lines 16-24 and col 8 lines 17-40) wherein a plurality of salient (grooved) portions are formed on at least one of the mating surfaces (col 3 lines 50-60). The plate and target are positioned adjacent one another forming an interlocked interface. Pressure is applied to consolidate the assembly under low temperature (below 50% of melting points of plate and target metals) (col 4 lines 25-46, col 6 lines 27-50 and col 8 lines 1-18). Note that Al which has a melting point of 680 C is heated to 300 C (col 4 lines 28-29 and col 7 line 21). As shown in figures 8 and 9 the edge is bent at an angle of less than about 90 degrees and forms "V" shaped ridges (col 6 lines 13-38). As shown in figure 4, these ridges are continuous which would form "M" shapes. See also Hunt claims 1-19.

Pierce teaches bonding a target to a plate wherein the peripheral part of the assembly is tack welded prior to interfacial bonding (col 8 lines 10-13, col 8 lines 41-50 and col 11 line 39 – col 12 line 14). The target is made of copper (col 10 lines 25-62).

However, there is no disclosure of TIG welding or of a filler material.

Qamar teaches joining a grooved Al target and Al backing plate (figures 1 and 7) wherein the peripheral boundary is sealed by a TIG weld (figure 3 and col 2 line 63 – col 3 line 15). Parts are positioned (col 4 lines 1-16 and lines 58-68) and the groove is filled with a welding material (col 8 lines 1-14). See also Qamar claims 1-20.

Art Unit: 1725

It would have been obvious to one of ordinary skill in the art at the time of the invention to employ the known method of TIG welding which typically employs a filler material to provide a strong reliable bond (Hunt, col 2 lines 9-19) of materials with different expansion rates and thereby prevent failures at the interface particularly with large targets and thereby provide an assembly that can be used over a wide range of power levels and temperatures (Hunt, col 2 lines 58-65 and col 4 lines 39-46) in a simple and conventional manner.

12. Claims 23 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hunt et al. (USPN 5836506) in view of Pierce et al. (USPN 4385979) as applied to claims 2 and 18 above, and further in view of Dunlop et al. (JPN 06-065733 A).

Hunt teaches a method of preparing a bonded sputter target/backing plate assembly comprising an Al, Ti or Co target and an Al, Cu, steel or Ti backing plate (col 4 lines 16-24 and col 8 lines 17-40) wherein a plurality of salient (grooved) portions are formed on at least one of the mating surfaces (col 3 lines 50-60). The plate and target are positioned adjacent one another forming an interlocked interface. Pressure is applied to consolidate the assembly under low temperature (below 50% of melting points of plate and target metals) (col 4 lines 25-46, col 6 lines 27-50 and col 8 lines 1-18). Note that Al which has a melting point of 680 C is heated to 300 C (col 4 lines 28-29 and col 7 line 21). As shown in figures 8 and 9 the edge is bent at an angle of less than about 90 degrees and forms "V" shaped ridges (col 6 lines 13-38). As shown in

Art Unit: 1725

figure 4, these ridges are continuous which would form "M" shapes. See also Hunt claims 1-19.

Pierce teaches bonding a target to a plate wherein the peripheral part of the assembly is tack welded prior to interfacial bonding (col 8 lines 10-13, col 8 lines 41-50 and col 11 line 39 – col 12 line 14). The target is made of copper (col 10 lines 25-62).

However, there is no disclosure of a Cu target.

Dunlop teaches joining a grooved Al or Cu target and an Al or Cu backing plate bonded under pressure and low temperatures (abstract).

It would have been obvious to one of ordinary skill in the art at the time of the invention to employ a Cu target bonded to an Al backing plate as an obvious variation of the Al target to Cu backing plate bond to provide a strong reliable bond (Hunt, col 2 lines 9-19) of materials with different expansion rates and thereby prevent failures at the interface particularly with large targets and thereby provide an assembly that can be used over a wide range of power levels and temperatures (Hunt, col 2 lines 58-65 and col 4 lines 39-46) when Cu is the desired deposition material.

13. Claims 6 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mueller et al. (USPN 5230459) in view of Pierce et al. (USPN 4385979) as applied to claim 2 above, and further in view of Stellrecht (USPN 5342496).

Mueller teaches a method of preparing a bonded sputter target/backing plate assembly comprising a titanium target and an aluminum backing plate (col 4 lines 63-65) wherein a plurality of salient (grooved) portions are formed on at least one of the

Art Unit: 1725

mating surfaces (col 4 lines 5-23). The plate and target are positioned adjacent one another forming an interlocked interface. Pressure is applied to consolidate the assembly under low temperature (below melting points of plate and target metals) (col 4 lines 46-69) preferably less than 600 C (col 5 lines 1-5). As shown in figure 2 the edge is bent at an angle of less than about 90 degrees and form "V" shaped ridges (col 5 lines 13-44). However, there is no disclosure of an additional peripheral weld or of the angle.

Pierce teaches bonding a target to a plate wherein the peripheral part of the assembly is tack welded prior to interfacial bonding (col 8 lines 10-13, col 8 lines 41-50 and col 11 line 39 – col 12 line 14). The target is made of copper (col 10 lines 25-62).

However, there is no disclosure of friction welding.

Stellrecht teaches a method of bonding a grooved target and backing plate by friction welding (col 4 lines 40-59) wherein the target and backing plate both comprise aluminum (col 5 lines 5-20).

It would have been obvious to one of ordinary skill in the art at the time of the invention to friction weld the target to the backing plate to prevent failures at the interface particularly with large targets and thereby provide an assembly that can be used over a wide range of power levels and temperatures (Mueller, col 5 lines 53-58) in a fast and cost-effective process (Mueller, col 5 lines 59-67 and col 6 lines 9-23).

Art Unit: 1725

Allowable Subject Matter

14. Claims 4, 5, 10, 11, 13 and 26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

15. The following is a statement of reasons for the indication of allowable subject matter: The closest prior art teaches the invention essentially as claimed but does not teach e-beam welding, friction welded cu targets or low temperature annealing. See Boys (USPN 5215639) and Hunt (USPN 5836506). When e-beam welding is taught, the assembly comprises a different configuration. See Strothers (USPN 5143590). When annealing is taught, typically one part or the other is annealed prior to assembly rather than annealing of the assembly at low temperatures. See Beier (USPN 6451185 B2).

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Matsuoka et al. (JPN 59-232270, grooves), Arima (JPN 04-128371 A, grooves), Ogata et al. (JPN 02-043362 A, grooves, combination), Yoshimura et al. (USPN 6074279, high temperature bonding), Takahashi et al. (USPN 6451135 B1, Cu target), Gilman et al. (USPN 6164519, grooves, combination), and Kardokus et al. (USPN 6113761).

Art Unit: 1725

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynne Edmondson whose telephone number is (703) 306-5699. The examiner can normally be reached on M-F from 7-4 with alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Dunn can be reached on (703) 308-3318. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-7718 for regular communications and (703) 305-7115 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0651.

Lynne Edmondson
Examiner
Art Unit 1725

 3/6/03

LRE
March 6, 2003